



Exhibit 9

Illustrative Claim Chart for U.S. Patent No. 9,482,632

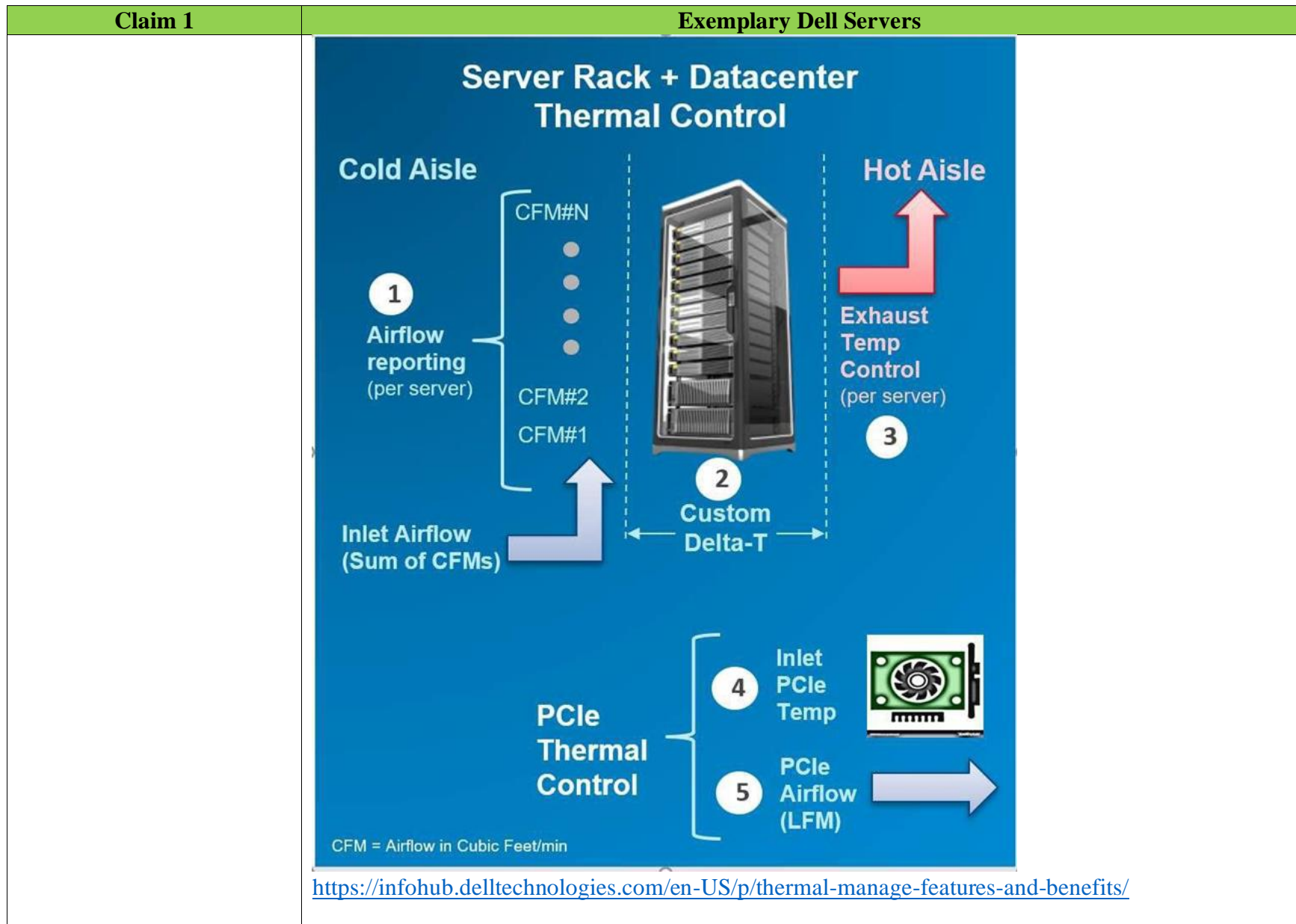
Claim 1	Exemplary Dell Servers		
<p>[Preamble] An abnormality detection device for detecting an abnormality in Information and Communication Technology (ICT) equipment having a cooling fan, the abnormality detection device comprising:</p>	<p>Dell PowerEdge servers are information and communication technology equipment having a cooling fan.</p> <p><i>See, e.g.,</i></p> <div><p>PowerEdge R6615</p><p>Powerful performance per investment dollar</p><p>The new Dell PowerEdge R6615 is a 1U, single-socket rack server. Designed to be the best investment per dollar for your data center, this server provides performance and flexible, low-latency storage options in an air or Direct Liquid Cooling (DLC) configuration.</p><table><tr><td>Fans</td><td><ul style="list-style-type: none">▪ Standard (STD) fans/High performance GOLD (VHP) fans▪ Up to 4 sets (dual fan module) hot plug fans</td></tr></table><p>https://www.delltechnologies.com/asset/en-us/products/servers/technical-support/powerededge-r6615-spec-sheet.pdf</p><p>For example, each PowerEdge server has an integrated Dell Remote Access Controller (iDRAC) for remote server administration, including detecting an abnormality.</p></div>	Fans	<ul style="list-style-type: none">▪ Standard (STD) fans/High performance GOLD (VHP) fans▪ Up to 4 sets (dual fan module) hot plug fans
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	<div></div> <div><h2>Full Access Management of PowerEdge Servers</h2></div> <div><h3>Modernize with Dell PowerEdge portfolio</h3></div> <div><p>The integrated Dell Remote Access Controller (iDRAC) delivers advanced, agent-free local and remote server administration. The iDRAC provides a secure means to automate a multitude of management tasks. Given that iDRAC is embedded in every PowerEdge server, there's no additional software to install. Once iDRAC has been enabled, you will have a complete set of server management features at your fingertips.</p></div> <div><p>https://www.delltechnologies.com/asset/en-us/solutions/infrastructure-solutions/briefs-summaries/integrated_dell EMC_remote_access_controller.pdf?ref=cpcl_open-manage-idrac-cta-content-item-30_cta_link_readbrief</p></div> <div><p>The iDRAC controller is a piece of hardware integrated on the motherboard of the server, and as well as other BMC solutions, has its own processor, memory, network connection, and access to the system bus. The iDRAC provides remote access to the system console (keyboard and screen), allowing the system BIOS to be accessed over the Internet when the server is rebooted. Key features of iDRAC include power management, virtual media access, and remote console capabilities. These features give administrators the ability to configure a machine as if they were sitting in front of the local console.</p></div> <div><p>https://www.storagereview.com/review/dell-emc-idrac-9-and-lifecycle-controller-review</p></div>

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[a] a hardware processor comprising:	<p>The Dell PowerEdge servers with iDRAC controllers have a hardware processor.</p> <p><i>See, e.g.,</i></p>																														


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	<div> </div> <div> <h2>PowerEdge R6615</h2> </div> <div> <p>Powerful performance per investment dollar</p> </div> <div> <p>The new Dell PowerEdge R6615 is a 1U, single-socket rack server. Designed to be the best investment per dollar for your data center, this server provides performance and flexible, low-latency storage options in an air or Direct Liquid Cooling (DLC) configuration.</p> </div> <div> <table> <tr> <th>Feature</th><th>Technical Specifications</th></tr> <tr> <td>Processor</td><td>One AMD EPYC 4th Generation 9004 Series with up to 128 cores</td></tr> </table> </div> <div> <p>https://www.delltechnologies.com/asset/en-us/products/servers/technical-support/powerededge-r6615-spec-sheet.pdf</p> </div> <div> <p>The iDRAC controller is a piece of hardware integrated on the motherboard of the server, and as well as other BMC solutions, has its own processor, memory, network connection, and access to the system bus. The iDRAC provides remote access to the system console (keyboard and screen), allowing the system BIOS to be accessed over the Internet when the server is rebooted. Key features of iDRAC include power management, virtual media access, and remote console capabilities. These features give administrators the ability to configure a machine as if they were sitting in front of the local console.</p> </div> <div> <p>https://www.storagereview.com/review/dell-emc-idrac-9-and-lifecycle-controller-review</p> </div>	Feature	Technical Specifications	Processor	One AMD EPYC 4th Generation 9004 Series with up to 128 cores
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	<p>For example, the iDRAC controller has an operational status detecting unit that detects an operational status of a PowerEdge server and a result of detection by an intake-air temperature sensor that detects an intake air temperature of intake air of the server. Dell PowerEdge servers have thermal sensors, including sensors that measure system inlet and exhaust temperatures.</p> <h2>Multi-Vector Cooling</h2> <p>Multi-Vector Cooling implements multi-prong approach to Thermal Controls in Dell EMC Server Platforms. You can configure multi-vector cooling options through iDRAC web interface by navigating to Configuration > System Settings > Hardware Settings > Fan Configuration. It includes (but not limited to):</p> <ul style="list-style-type: none"> • Large set of sensors (thermal, power, inventory etc.) that allows accurate interpretation of real-time system thermal state at various locations within the server. It displays only a small subset of sensors that are relevant to users need based on the configuration. • Intelligent and adaptive closed loop control algorithm optimizes fan response to maintain component temperatures. It also conserves fan power, airflow consumption, and acoustics. • Using fan zone mapping, cooling can be initiated for the components when it requires. Thus, it results maximum performance without compromising the efficiency of power utilization. • Accurate representation of slot by slot PCIe airflow in terms of LFM metric (Linear Feet per Minute - an accepted industry standard on how PCIe card airflow requirement is specified). Display of this metric in various iDRAC interfaces allows user to: <ol style="list-style-type: none"> 1. know the maximum LFM capability of each slot within the server. 2. know what approach is being taken for PCIe cooling for each slot (airflow controlled, temperature controlled). 3. know the minimum LFM being delivered to a slot, if the card is a 3rd Party Card (user defined custom card). 4. dial in custom minimum LFM value for the 3rd Party Card allowing more accurate definition of the card cooling needs for which the user is better aware of through their custom card specification. • Displays real-time system airflow metric (CFM, cubic feet per minute) in various iDRAC interfaces to the user to enable datacenter airflow balancing based on aggregation of per server CFM consumption. • Allows custom thermal settings like Thermal Profiles (Maximum Performance vs. Maximum Performance per Watt, Sound Cap), custom fan speed options (minimum fan speed, fan speed offsets) and custom Exhaust Temperature settings. <p>https://dl.dell.com/topicspdf/idrac9-lifecycle-controller-v33-series_users-guide7_en-us.pdf</p>

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	<h2>Viewing sensor information</h2> <p>The following sensors help to monitor the health of the managed system:</p> <ul style="list-style-type: none"> • Batteries — Provides information about the batteries on the system board CMOS and storage RAID On Motherboard (ROMB). <i>i</i> NOTE: The Storage ROMB battery settings are available only if the system has a ROMB with a battery. • Fan (available only for rack and tower servers) — Provides information about the system fans — fan redundancy and fans list that display fan speed and threshold values. <p>100 Viewing iDRAC and managed system information</p> <hr/> <ul style="list-style-type: none"> • CPU — Indicates the health and state of the CPUs in the managed system. It also reports processor automatic throttling and predictive failure. • Memory — Indicates the health and state of the Dual In-line Memory Modules (DIMMs) present in the managed system. • Intrusion — Provides information about the chassis. • Power Supplies (available only for rack and tower servers) — Provides information about the power supplies and the power supply redundancy status. <p><i>i</i> NOTE: If there is only one power supply in the system, the power supply redundancy is set to Disabled.</p> <ul style="list-style-type: none"> • Removable Flash Media — Provides information about the Internal SD Modules; vFlash and Internal Dual SD Module (IDSDM). <ul style="list-style-type: none"> • When IDSDM redundancy is enabled, the following IDSDM sensor status is displayed — IDSDM Redundancy Status, IDSDM SD1, IDSDM SD2. When redundancy is disabled, only IDSDM SD1 is displayed. • If IDSDM redundancy is initially disabled when the system is powered on or after an iDRAC reset, the IDSDM SD1 sensor status is displayed only after a card is inserted. • If IDSDM redundancy is enabled with two SD cards present in the IDSDM, and the status of one SD card is online while the status of the other card is offline. A system reboot is required to restore redundancy between the two SD cards in the IDSDM. After the redundancy is restored, the status of both the SD cards in the IDSDM is online. • During the rebuilding operation to restore redundancy between two SD cards present in the IDSDM, the IDSDM status is not displayed since the IDSDM sensors are powered off. <p><i>i</i> NOTE: If the host system is rebooted during IDSDM rebuild operation, the iDRAC does not display the IDSDM information. To resolve this, rebuild IDSDM again or reset the iDRAC.</p> <ul style="list-style-type: none"> • System Event Logs (SEL) for a write-protected or corrupt SD card in the IDSDM module are not repeated until they are cleared by replacing the SD card with a writable or good SD card, respectively. • Temperature — Provides information about the system board inlet temperature and exhaust temperature (only applies to rack servers). The temperature probe indicates whether the status of the probe is within the preset warning and critical threshold value. • Voltage — Indicates the status and reading of the voltage sensors on various system components. <p>https://dl.dell.com/topicspdf/idrac9-lifecycle-controller-v33-series_users-guide7_en-us.pdf</p>


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	<p>For example, the iDRAC controller allows users to modify thermal settings, including setting temperature limits.</p> <h2>Modifying thermal settings using iDRAC web interface</h2> <p>To modify the thermal settings:</p> <ol style="list-style-type: none"> <li>1. In the iDRAC Web interface, go to Configuration > System Settings > Hardware Settings > Cooling Configuration. <li>2. Specify the following: <ul style="list-style-type: none"> <li>• Thermal Profile Optimization — Select the thermal profile: <ul style="list-style-type: none"> <li>• Default Thermal Profile Settings (Minimum Power) — Implies that the thermal algorithm uses the same system profile settings that is defined under System BIOS > System BIOS Settings > System Profile Settings page. <p>By default, this option is set to Default Thermal Profile Settings. You can also select a custom algorithm, which is independent of the BIOS profile. The options available are:</p> <ul style="list-style-type: none"> <li>• Maximum Performance (Performance Optimized) : <ul style="list-style-type: none"> <li>• Reduced probability of memory or CPU throttling. <li>• Increased probability of turbo mode activation. <li>• Generally, higher fan speeds at idle and stress loads. <li>• Minimum Power (Performance per Watt Optimized): <ul style="list-style-type: none"> <li>• Optimized for lowest system power consumption based on optimum fan power state. <li>• Generally, lower fan speeds at idle and stress loads. <li>• Sound Cap — Sound Cap provides reduced acoustical output from a server at the expense of some performance. Enabling Sound Cap may include temporary deployment or evaluation of a server in an occupied space, but it should not be used during benchmarking or performance sensitive applications. <p> NOTE: Selecting Maximum Performance or Minimum Power, overrides thermal settings associated to System Profile setting under System BIOS > System BIOS Settings.System Profile Settings page.</p> <ul style="list-style-type: none"> <li>• Maximum Exhaust Temperature Limit — From the drop-down menu, select the maximum exhaust air temperature. The values are displayed based on the system. <p>The default value is Default, 70°C (158 °F).</p> <p>This option allows the system fans speeds to change such that the exhaust temperature does not exceed the selected exhaust temperature limit. This cannot always be guaranteed under all system operating conditions due to dependency on system load and system cooling capability.</p> <p>https://dl.dell.com/topicspdf/idrac9-lifecycle-controller-v33-series_users-guide7_en-us.pdf</p>

Claim 1	Exemplary Dell Servers
	<ul style="list-style-type: none"> • Thresholds <ul style="list-style-type: none"> • Maximum PCIe Inlet Temperature Limit — Default value is 55°C. Select the lower temperature of 45°C for third party PCIe cards which require lower inlet temperature. • Exhaust Temperature Limits — By modifying the values for the following you can set the exhaust temperature limits: <div style="text-align: right;">Setting up managed system 53</div> <hr/> <ul style="list-style-type: none"> • Set Maximum Exhaust Temperature Limit • Set Air Temperature Rise Limit • Minimum Fan Speed in PWM (% of Max) — Select this option to fine tune the fan speed. Using this option, you can set a higher baseline system fan speed or increase the system fan speed if other custom fan speed options are not resulting in the required higher fan speeds. <ul style="list-style-type: none"> • Default — Sets minimum fan speed to default value as determined by the system cooling algorithm. • Custom — Enter the percentage by which you want to change the fan speed. Range is between 9-100. <p>The allowable range for minimum fan speed PWM is dynamic based on the system configuration. The first value is the idle speed and the second value is the configuration max (Depending on the system configuration, the maximum speed may be up to 100%).</p> <p>System fans can run higher than this speed as per thermal requirements of the system but not lower than the defined minimum speed. For example, setting Minimum Fan Speed at 35% limits the fan speed to never go lower than 35% PWM.</p> <p>https://dl.dell.com/topicspdf/idrac9-lifecycle-controller-v33-series_users-guide7_en-us.pdf</p>
[c] wherein the operational status of the ICT equipment and the intake air temperature of the ICT equipment determines a	<p>The Dell PowerEdge servers with iDRAC controllers are information and communication technology equipment having a cooling fan.</p> <p><i>See, e.g.,</i></p>

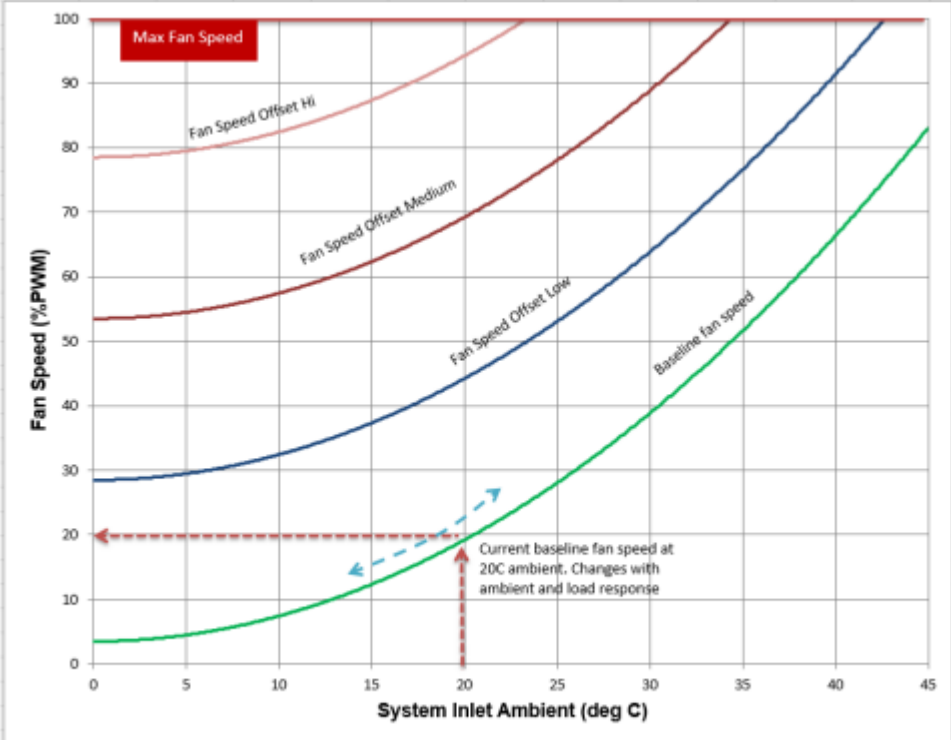
Claim 1	Exemplary Dell Servers		
rotation speed of the cooling fan; and	<div> </div> <div> <h2>PowerEdge R6615</h2> </div> <div> <p>Powerful performance per investment dollar</p> </div> <div> <p>The new Dell PowerEdge R6615 is a 1U, single-socket rack server. Designed to be the best investment per dollar for your data center, this server provides performance and flexible, low-latency storage options in an air or Direct Liquid Cooling (DLC) configuration.</p> </div> <div> <table> <tr> <td>Fans</td><td> <ul style="list-style-type: none"> ▪ Standard (STD) fans/High performance GOLD (VHP) fans ▪ Up to 4 sets (dual fan module) hot plug fans </td></tr> </table> </div> <div> <p>https://www.delltechnologies.com/asset/en-us/products/servers/technical-support/powerededge-r6615-spec-sheet.pdf</p> </div> <div> <p>For example, Dell PowerEdge servers have thermal sensors, including sensors that measure system inlet and exhaust temperatures.</p> </div>	Fans	<ul style="list-style-type: none"> ▪ Standard (STD) fans/High performance GOLD (VHP) fans ▪ Up to 4 sets (dual fan module) hot plug fans
Fans	<ul style="list-style-type: none"> ▪ Standard (STD) fans/High performance GOLD (VHP) fans ▪ Up to 4 sets (dual fan module) hot plug fans 		

Claim 1	Exemplary Dell Servers
	<h2>Multi-Vector Cooling</h2> <p>Multi-Vector Cooling implements multi-prong approach to Thermal Controls in Dell EMC Server Platforms. You can configure multi-vector cooling options through iDRAC web interface by navigating to Configuration > System Settings > Hardware Settings > Fan Configuration. It includes (but not limited to):</p> <ul style="list-style-type: none"> • Large set of sensors (thermal, power, inventory etc.) that allows accurate interpretation of real-time system thermal state at various locations within the server. It displays only a small subset of sensors that are relevant to users need based on the configuration. • Intelligent and adaptive closed loop control algorithm optimizes fan response to maintain component temperatures. It also conserves fan power, airflow consumption, and acoustics. • Using fan zone mapping, cooling can be initiated for the components when it requires. Thus, it results maximum performance without compromising the efficiency of power utilization. • Accurate representation of slot by slot PCIe airflow in terms of LFM metric (Linear Feet per Minute - an accepted industry standard on how PCIe card airflow requirement is specified). Display of this metric in various iDRAC interfaces allows user to: <ol style="list-style-type: none"> 1. know the maximum LFM capability of each slot within the server. 2. know what approach is being taken for PCIe cooling for each slot (airflow controlled, temperature controlled). 3. know the minimum LFM being delivered to a slot, if the card is a 3rd Party Card (user defined custom card). 4. dial in custom minimum LFM value for the 3rd Party Card allowing more accurate definition of the card cooling needs for which the user is better aware of through their custom card specification. • Displays real-time system airflow metric (CFM, cubic feet per minute) in various iDRAC interfaces to the user to enable datacenter airflow balancing based on aggregation of per server CFM consumption. • Allows custom thermal settings like Thermal Profiles (Maximum Performance vs. Maximum Performance per Watt, Sound Cap), custom fan speed options (minimum fan speed, fan speed offsets) and custom Exhaust Temperature settings. <p>https://dl.dell.com/topicspdf/idrac9-lifecycle-controller-v33-series_users-guide7_en-us.pdf</p>

Claim 1	Exemplary Dell Servers
	<h2>Viewing sensor information</h2> <p>The following sensors help to monitor the health of the managed system:</p> <ul style="list-style-type: none"> • Batteries — Provides information about the batteries on the system board CMOS and storage RAID On Motherboard (ROMB). <i>i</i> NOTE: The Storage ROMB battery settings are available only if the system has a ROMB with a battery. • Fan (available only for rack and tower servers) — Provides information about the system fans — fan redundancy and fans list that display fan speed and threshold values. <p>100 Viewing iDRAC and managed system information</p> <hr/> <ul style="list-style-type: none"> • CPU — Indicates the health and state of the CPUs in the managed system. It also reports processor automatic throttling and predictive failure. • Memory — Indicates the health and state of the Dual In-line Memory Modules (DIMMs) present in the managed system. • Intrusion — Provides information about the chassis. • Power Supplies (available only for rack and tower servers) — Provides information about the power supplies and the power supply redundancy status. <p><i>i</i> NOTE: If there is only one power supply in the system, the power supply redundancy is set to Disabled.</p> <ul style="list-style-type: none"> • Removable Flash Media — Provides information about the Internal SD Modules; vFlash and Internal Dual SD Module (IDSDM). <ul style="list-style-type: none"> • When IDSDM redundancy is enabled, the following IDSDM sensor status is displayed — IDSDM Redundancy Status, IDSDM SD1, IDSDM SD2. When redundancy is disabled, only IDSDM SD1 is displayed. • If IDSDM redundancy is initially disabled when the system is powered on or after an iDRAC reset, the IDSDM SD1 sensor status is displayed only after a card is inserted. • If IDSDM redundancy is enabled with two SD cards present in the IDSDM, and the status of one SD card is online while the status of the other card is offline. A system reboot is required to restore redundancy between the two SD cards in the IDSDM. After the redundancy is restored, the status of both the SD cards in the IDSDM is online. • During the rebuilding operation to restore redundancy between two SD cards present in the IDSDM, the IDSDM status is not displayed since the IDSDM sensors are powered off. <p><i>i</i> NOTE: If the host system is rebooted during IDSDM rebuild operation, the iDRAC does not display the IDSDM information. To resolve this, rebuild IDSDM again or reset the iDRAC.</p> <ul style="list-style-type: none"> • System Event Logs (SEL) for a write-protected or corrupt SD card in the IDSDM module are not repeated until they are cleared by replacing the SD card with a writable or good SD card, respectively. • Temperature — Provides information about the system board inlet temperature and exhaust temperature (only applies to rack servers). The temperature probe indicates whether the status of the probe is within the preset warning and critical threshold value. • Voltage — Indicates the status and reading of the voltage sensors on various system components. <p>https://dl.dell.com/topicspdf/idrac9-lifecycle-controller-v33-series_users-guide7_en-us.pdf</p>


Claim 1	Exemplary Dell Servers
	<p>For example, the iDRAC controller allows users to modify thermal settings, including setting temperature limits and fan speed.</p> <h2>Modifying thermal settings using iDRAC web interface</h2> <p>To modify the thermal settings:</p> <ol style="list-style-type: none"> <li>1. In the iDRAC Web interface, go to Configuration > System Settings > Hardware Settings > Cooling Configuration. <li>2. Specify the following: <ul style="list-style-type: none"> <li>• Thermal Profile Optimization — Select the thermal profile: <ul style="list-style-type: none"> <li>• Default Thermal Profile Settings (Minimum Power) — Implies that the thermal algorithm uses the same system profile settings that is defined under System BIOS > System BIOS Settings > System Profile Settings page. <p>By default, this option is set to Default Thermal Profile Settings. You can also select a custom algorithm, which is independent of the BIOS profile. The options available are:</p> <ul style="list-style-type: none"> <li>• Maximum Performance (Performance Optimized) : <ul style="list-style-type: none"> <li>• Reduced probability of memory or CPU throttling. <li>• Increased probability of turbo mode activation. <li>• Generally, higher fan speeds at idle and stress loads. <li>• Minimum Power (Performance per Watt Optimized): <ul style="list-style-type: none"> <li>• Optimized for lowest system power consumption based on optimum fan power state. <li>• Generally, lower fan speeds at idle and stress loads. <li>• Sound Cap — Sound Cap provides reduced acoustical output from a server at the expense of some performance. Enabling Sound Cap may include temporary deployment or evaluation of a server in an occupied space, but it should not be used during benchmarking or performance sensitive applications. <p> NOTE: Selecting Maximum Performance or Minimum Power, overrides thermal settings associated to System Profile setting under System BIOS > System BIOS Settings.System Profile Settings page.</p> <ul style="list-style-type: none"> <li>• Maximum Exhaust Temperature Limit — From the drop-down menu, select the maximum exhaust air temperature. The values are displayed based on the system. <p>The default value is Default, 70°C (158 °F).</p> <p>This option allows the system fans speeds to change such that the exhaust temperature does not exceed the selected exhaust temperature limit. This cannot always be guaranteed under all system operating conditions due to dependency on system load and system cooling capability.</p> <p>https://dl.dell.com/topicspdf/idrac9-lifecycle-controller-v33-series_users-guide7_en-us.pdf</p>

Claim 1	Exemplary Dell Servers
	<ul style="list-style-type: none"> • Thresholds <ul style="list-style-type: none"> • Maximum PCIe Inlet Temperature Limit — Default value is 55°C. Select the lower temperature of 45°C for third party PCIe cards which require lower inlet temperature. • Exhaust Temperature Limits — By modifying the values for the following you can set the exhaust temperature limits: <div style="text-align: right; margin-top: 20px;">Setting up managed system 53</div> <hr style="border: 1px solid gray; margin: 20px 0;"/> <ul style="list-style-type: none"> • Set Maximum Exhaust Temperature Limit • Set Air Temperature Rise Limit • Minimum Fan Speed in PWM (% of Max) — Select this option to fine tune the fan speed. Using this option, you can set a higher baseline system fan speed or increase the system fan speed if other custom fan speed options are not resulting in the required higher fan speeds. <ul style="list-style-type: none"> • Default — Sets minimum fan speed to default value as determined by the system cooling algorithm. • Custom — Enter the percentage by which you want to change the fan speed. Range is between 9-100. <p>The allowable range for minimum fan speed PWM is dynamic based on the system configuration. The first value is the idle speed and the second value is the configuration max (Depending on the system configuration, the maximum speed may be up to 100%).</p> <p>System fans can run higher than this speed as per thermal requirements of the system but not lower than the defined minimum speed. For example, setting Minimum Fan Speed at 35% limits the fan speed to never go lower than 35% PWM.</p> <p>https://dl.dell.com/topicspdf/idrac9-lifecycle-controller-v33-series_users-guide7_en-us.pdf</p>

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	 <p>Figure 1 Illustration of how the fan speed offset increases the fan speed above the baseline (green line)</p> <p>“Custom Cooling Fan Options for Dell EMC PowerEdge Servers” (October 2019)</p>
<p>[d] a determining unit configured to determine that an abnormality is occurring when a result of detection by a temperature sensor that detects a detected equipment temperature in the predetermined position is beyond the upper limit</p>	<p>The Dell PowerEdge servers with iDRAC controllers have a determining unit configured to determine that an abnormality is occurring when a result of detection by a temperature sensor that detects a detected equipment temperature in the predetermined position of a PowerEdge server is beyond the upper limit estimated by the estimating unit.</p> <p>See, e.g.,</p>

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estimated by the estimating unit.	<h2>Multi-Vector Cooling</h2> <p>Multi-Vector Cooling implements multi-prong approach to Thermal Controls in Dell EMC Server Platforms. You can configure multi-vector cooling options through iDRAC web interface by navigating to Configuration > System Settings > Hardware Settings > Fan Configuration. It includes (but not limited to):</p> <ul style="list-style-type: none"> • Large set of sensors (thermal, power, inventory etc.) that allows accurate interpretation of real-time system thermal state at various locations within the server. It displays only a small subset of sensors that are relevant to users need based on the configuration. • Intelligent and adaptive closed loop control algorithm optimizes fan response to maintain component temperatures. It also conserves fan power, airflow consumption, and acoustics. • Using fan zone mapping, cooling can be initiated for the components when it requires. Thus, it results maximum performance without compromising the efficiency of power utilization. • Accurate representation of slot by slot PCIe airflow in terms of LFM metric (Linear Feet per Minute - an accepted industry standard on how PCIe card airflow requirement is specified). Display of this metric in various iDRAC interfaces allows user to: <ol style="list-style-type: none"> 1. know the maximum LFM capability of each slot within the server. 2. know what approach is being taken for PCIe cooling for each slot (airflow controlled, temperature controlled). 3. know the minimum LFM being delivered to a slot, if the card is a 3rd Party Card (user defined custom card). 4. dial in custom minimum LFM value for the 3rd Party Card allowing more accurate definition of the card cooling needs for which the user is better aware of through their custom card specification. • Displays real-time system airflow metric (CFM, cubic feet per minute) in various iDRAC interfaces to the user to enable datacenter airflow balancing based on aggregation of per server CFM consumption. • Allows custom thermal settings like Thermal Profiles (Maximum Performance vs. Maximum Performance per Watt, Sound Cap), custom fan speed options (minimum fan speed, fan speed offsets) and custom Exhaust Temperature settings. <p>https://dl.dell.com/topicspdf/idrac9-lifecycle-controller-v33-series_users-guide7_en-us.pdf</p>

Claim 1	Exemplary Dell Servers
	<h2>Viewing sensor information</h2> <p>The following sensors help to monitor the health of the managed system:</p> <ul style="list-style-type: none"> • Batteries — Provides information about the batteries on the system board CMOS and storage RAID On Motherboard (ROMB). <i>i</i> NOTE: The Storage ROMB battery settings are available only if the system has a ROMB with a battery. • Fan (available only for rack and tower servers) — Provides information about the system fans — fan redundancy and fans list that display fan speed and threshold values. <p>100 Viewing iDRAC and managed system information</p> <hr/> <ul style="list-style-type: none"> • CPU — Indicates the health and state of the CPUs in the managed system. It also reports processor automatic throttling and predictive failure. • Memory — Indicates the health and state of the Dual In-line Memory Modules (DIMMs) present in the managed system. • Intrusion — Provides information about the chassis. • Power Supplies (available only for rack and tower servers) — Provides information about the power supplies and the power supply redundancy status. <p><i>i</i> NOTE: If there is only one power supply in the system, the power supply redundancy is set to Disabled.</p> <ul style="list-style-type: none"> • Removable Flash Media — Provides information about the Internal SD Modules; vFlash and Internal Dual SD Module (IDSDM). <ul style="list-style-type: none"> • When IDSDM redundancy is enabled, the following IDSDM sensor status is displayed — IDSDM Redundancy Status, IDSDM SD1, IDSDM SD2. When redundancy is disabled, only IDSDM SD1 is displayed. • If IDSDM redundancy is initially disabled when the system is powered on or after an iDRAC reset, the IDSDM SD1 sensor status is displayed only after a card is inserted. • If IDSDM redundancy is enabled with two SD cards present in the IDSDM, and the status of one SD card is online while the status of the other card is offline. A system reboot is required to restore redundancy between the two SD cards in the IDSDM. After the redundancy is restored, the status of both the SD cards in the IDSDM is online. • During the rebuilding operation to restore redundancy between two SD cards present in the IDSDM, the IDSDM status is not displayed since the IDSDM sensors are powered off. <p><i>i</i> NOTE: If the host system is rebooted during IDSDM rebuild operation, the iDRAC does not display the IDSDM information. To resolve this, rebuild IDSDM again or reset the iDRAC.</p> <ul style="list-style-type: none"> • System Event Logs (SEL) for a write-protected or corrupt SD card in the IDSDM module are not repeated until they are cleared by replacing the SD card with a writable or good SD card, respectively. • Temperature — Provides information about the system board inlet temperature and exhaust temperature (only applies to rack servers). The temperature probe indicates whether the status of the probe is within the preset warning and critical threshold value. • Voltage — Indicates the status and reading of the voltage sensors on various system components. <p>https://dl.dell.com/topicspdf/idrac9-lifecycle-controller-v33-series_users-guide7_en-us.pdf</p>

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	<p>For example, the iDRAC controller allows users to modify thermal settings, including setting temperature limits.</p> <h2>Modifying thermal settings using iDRAC web interface</h2> <p>To modify the thermal settings:</p> <ol style="list-style-type: none"> <li>1. In the iDRAC Web interface, go to Configuration > System Settings > Hardware Settings > Cooling Configuration. <li>2. Specify the following: <ul style="list-style-type: none"> <li>• Thermal Profile Optimization — Select the thermal profile: <ul style="list-style-type: none"> <li>• Default Thermal Profile Settings (Minimum Power) — Implies that the thermal algorithm uses the same system profile settings that is defined under System BIOS > System BIOS Settings > System Profile Settings page. <p>By default, this option is set to Default Thermal Profile Settings. You can also select a custom algorithm, which is independent of the BIOS profile. The options available are:</p> <ul style="list-style-type: none"> <li>• Maximum Performance (Performance Optimized) : <ul style="list-style-type: none"> <li>• Reduced probability of memory or CPU throttling. <li>• Increased probability of turbo mode activation. <li>• Generally, higher fan speeds at idle and stress loads. <li>• Minimum Power (Performance per Watt Optimized): <ul style="list-style-type: none"> <li>• Optimized for lowest system power consumption based on optimum fan power state. <li>• Generally, lower fan speeds at idle and stress loads. <li>• Sound Cap — Sound Cap provides reduced acoustical output from a server at the expense of some performance. Enabling Sound Cap may include temporary deployment or evaluation of a server in an occupied space, but it should not be used during benchmarking or performance sensitive applications. <p> NOTE: Selecting Maximum Performance or Minimum Power, overrides thermal settings associated to System Profile setting under System BIOS > System BIOS Settings.System Profile Settings page.</p> <ul style="list-style-type: none"> <li>• Maximum Exhaust Temperature Limit — From the drop-down menu, select the maximum exhaust air temperature. The values are displayed based on the system. <p>The default value is Default, 70°C (158 °F).</p> <p>This option allows the system fans speeds to change such that the exhaust temperature does not exceed the selected exhaust temperature limit. This cannot always be guaranteed under all system operating conditions due to dependency on system load and system cooling capability.</p> <p>https://dl.dell.com/topicspdf/idrac9-lifecycle-controller-v33-series_users-guide7_en-us.pdf</p>

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	<ul style="list-style-type: none"> • Thresholds <ul style="list-style-type: none"> • Maximum PCIe Inlet Temperature Limit — Default value is 55°C. Select the lower temperature of 45°C for third party PCIe cards which require lower inlet temperature. • Exhaust Temperature Limits — By modifying the values for the following you can set the exhaust temperature limits: <div style="text-align: right; margin-top: 20px;">Setting up managed system 53</div> <hr style="border: 1px solid #ccc; margin: 20px 0;"/> <ul style="list-style-type: none"> • Set Maximum Exhaust Temperature Limit • Set Air Temperature Rise Limit • Minimum Fan Speed in PWM (% of Max) — Select this option to fine tune the fan speed. Using this option, you can set a higher baseline system fan speed or increase the system fan speed if other custom fan speed options are not resulting in the required higher fan speeds. <ul style="list-style-type: none"> • Default — Sets minimum fan speed to default value as determined by the system cooling algorithm. • Custom — Enter the percentage by which you want to change the fan speed. Range is between 9-100. <p>The allowable range for minimum fan speed PWM is dynamic based on the system configuration. The first value is the idle speed and the second value is the configuration max (Depending on the system configuration, the maximum speed may be up to 100%).</p> <p>System fans can run higher than this speed as per thermal requirements of the system but not lower than the defined minimum speed. For example, setting Minimum Fan Speed at 35% limits the fan speed to never go lower than 35% PWM.</p> <p>https://dl.dell.com/topicspdf/idrac9-lifecycle-controller-v33-series_users-guide7_en-us.pdf</p> <p>For example, the iDRAC controller interface displays the current system exhaust temperature and the target exhaust system limit.</p>

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	<p>iDRAC Thermal Manage features require an iDRAC Datacenter license. Here is an image from the iDRAC GUI showing the thermal telemetry and customization options:</p> <p>▼ Cooling Configuration</p> <div><div><p>Automatic Fan Speed Calculation</p><p>Thermal Profile Optimization</p><p>Fan Speed Offset</p><p>Thresholds</p><p>Exhaust Temperature Limits</p><p>Minimum Fan Speed in PWM (% of Max)</p></div><div><p>Default Thermal Profile Settings (Maximum Performance) ▼</p><p>Off ▼</p><p>System Inlet Temperature 22°C (71.6°F)</p><p>System Exhaust Temperature 25°C (77.0°F)</p><p>Set Maximum Exhaust Temperature Limit Default, 70°C (158.0°F) ▼</p><p>Target Exhaust Temperature Limit 70°C (158.0°F)</p><p>Default ▼ (Range 25 - 100)</p><p>Apply Discard</p></div></div>